

Calculation of Preliminary Remediation Goals for 11 Radionuclides

The summary tables provided herein list standardized EPA Preliminary Remediation Goals (PRGs) for 11 radionuclides generated from the online calculation tool (calculator)/database for the purpose of facilitating risk assessment and decision-making at CERCLA sites. The standardized (default) Radionuclide PRGs are tabulated based on a 1E-06 incremental risk of an individual developing cancer over a lifetime as a result of exposure to a specified radionuclide from all significant exposure pathways for a given medium. The PRG databases contain default exposure parameters obtained from the [[HYPERLINK](http://www.epa.gov/oswer/riskassessment/ragsb/) "http://www.epa.gov/oswer/riskassessment/ragsb/"] (*RAGS Part B*) [EPA Risk Assessment Guidance] that represent the reasonably maximally exposure (RME) conditions. The PRG calculator combines current slope factors (SFs) from the [[HYPERLINK](http://ordose.ornl.gov/index.html) "http://ordose.ornl.gov/index.html"], with the RME standard exposure factors from EPA's Risk Assessment Guidance to estimate contaminant concentrations in environmental media (biota, air, soil and water) that are protective of humans (including sensitive groups) over a lifetime.

The first two tables below provide Building PRGs (BPRGs) for two land use scenarios, indoor worker and residential, based on default parameters provided in the BPRG calculator. The third table provides PRGs for the outdoor worker scenario using defaults in the standard PRG calculator. The EPA Radionuclide BPRG calculator can be found at [[HYPERLINK](https://epa-bprg.ornl.gov/) "https://epa-bprg.ornl.gov/"]. Results are provided in units of picocuries (pCi) per gram (g), per square centimeter (cm²), or per cubic meter (m³). The EPA Radionuclide PRG calculator can be obtained at: [[HYPERLINK](https://epa-prgs.ornl.gov/radionuclides) "https://epa-prgs.ornl.gov/radionuclides"].

In some cases, like for tritium (hydrogen 3; H-3), entries for some exposure pathways in the tables are "N/A" (not applicable). Hydrogen is a gas and does not adhere to surfaces of structures or to dust, so a PRG is not provided for these exposure pathways. For strontium 90 (Sr-90), the primary exposure pathways are through ingestion and inhalation, so a PRG for exposure from surfaces is not provided by the calculator.

The 11 radionuclides are americium 241 (Am-241), cobalt 60 (Co-60), cesium 137 (Cs-137), europium 152 (Eu-152), Eu-154, H-3, plutonium 239 (Pu-239), radium 226 (Ra-226), Sr-90, thorium 232 (Th-232), and uranium 235 (U-235). For U-235, exposure from daughter products in the U-235 decay chain (U-235+D) is included in the PRG calculations.

I. INDOOR WORKER BUILDING PRELIMINARY REMEDIATION GOALS – DEFAULT SCENARIO

Building Preliminary Remediation Goals (BPRGs) Indoor Worker External Exposure				
	External Exposure		Air Exposure	Dust Exposure
Radionuclide	3-D External Ground Plane BPRG (pCi/cm ²)	3-D External Soil Volume BPRG (pCi/g)	Total BPRG (pCi/m ³)	Total BPRG (pCi/m ³)
Am-241	3.89E+00	5.35E+00	2.16E-04	1.02E-02
Co-60	8.56E-02	1.01E-02	2.70E-01	1.66E-01
Cs-137	2.13E+02	2.17E+02	9.35E-02	3.75E-02
Eu-152	6.06E-02	8.28E-03	7.41E-02	N/A
Eu-154	9.77E-02	1.75E-02	9.02E-02	2.07E-01
H-3	N/A	N/A	1.76E+01	N/A
Pu-239	3.86E+03	1.78E+03	1.44E-04	7.50E-03
Ra-226	1.57E+01	3.85E+00	2.86E-04	3.10E-03
Sr-90	Not calculated	Not calculated	2.50E-02	2.35E-02
Th-232	3.18E+02	8.36E+01	1.85E-04	1.07E-02
U-235+D	2.04E-01	5.27E-02	3.20E-04	1.79E-02

II. RESIDENT BUILDING PRELIMINARY REMEDIATION GOALS DEFAULT SCENARIO

Building Preliminary Remediation Goals (BPRGs) Resident External Exposure				
	External Exposure		Air Exposure	Dust Exposure
Radionuclide	3-D External Ground Plane BPRG (pCi/cm ²)	3-D External Soil Volume BPRG (pCi/g)	Total BPRG (pCi/m ³)	Dust BPRG (pCi/cm ²)
Am-241	8.92E-01	1.23E+00	1.68E-04	1.73E-03
Co-60	2.03E-02	2.40E-03	2.14E-01	2.00E-02
Cs-137	4.93E+01	5.02E+01	7.33E-02	9.75E-03
Eu-152	1.42E-02	1.93E-03	5.85E-02	2.50E-02
Eu-154	2.30E-02	4.11E-03	7.18E-02	2.20E-02
H-3	N/A	N/A	1.40E+01	N/A
Pu-239	8.83E+02	4.07E+02	1.40E+01	1.37E-03
Ra-226	3.60E+00	8.81E-01	1.12E-04	4.64E-04
Sr-90	Not calculated	Not calculated	2.22E-04	4.88E-03
Th-232	7.28E+01	1.91E+01	2.21E-04	1.70E-03
U-235+D	4.68E-02	1.21E-02	1.96E-02	2.02E-03

III. OUTDOOR WORKER – DEFAULT SCENARIO

Preliminary Remediation Goals (PRGs) Outdoor Worker External Exposure				
	External Exposure		Air Exposure	Soil Exposure
Radionuclide	3-D External Ground Plane BPRG (pCi/cm²)	3-D External Soil Volume BPRG (pCi/g)	Total BPRG (pCi/m³)	Total PRG (pCi/g)
Am-241	1.06E+01	7.18E+00	2.40E-04	5.19E+00
Co-60	3.04E-01	5.37E-02	3.00E-01	5.37E-02
Cs-137	4.62E+02	4.63E+02	1.04E-01	6.34E+01
Eu-152	3.37E-01	6.38E-02	8.23E-02	6.38E-02
Eu-154	4.13E-01	7.74E-02	1.00E-01	7.74E-02
H-3	N/A	N/A	1.95E+01	3.32E-01
Pu-239	9.48E+02	9.32E+02	1.60E-04	1.36E+01
Ra-226	3.13E+01	7.83E+00	3.17E-04	3.39E+00
Sr-90	7.70E+02	5.96E+02	2.78E-02	4.27E+01
Th-232	5.98E+02	5.43E+02	2.05E-04	1.88E+01
U-235+D	1.28E+00	3.38E-01	3.55E-04	3.35E-01